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Consumption Expenditure on Health and Education: Econometric Models and evolution of OECD countries in 1970-96

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Abstract

We analyse the evolution of Private Consumption on two special groups of expenditure: Health, and Education and Culture, having into account that there are some substitution effects between public and private expenditure on both groups. The comparison is made with data of real private expenditure by inhabitant, at 1990 prices and exchange rates, for 13 OECD countries in the period 1970-94 and with data of real public and private expenditure by inhabitant for 24 countries in the year 1996. We estimate some econometric models for private expenditure and the results confirm the existence of the substitution effect and that this effect seems to be higher in the case of Health. From the analysis of the evolution of these variable our main conclusion is that the to increase the expenditure on both groups, with economic development, is positive for welfare and obeys to a rational behaviour of consumers. So we do not agree with the propositions and attempts to cut public expenditure on these important services, which sometimes are made in the name of a kind economic efficiency that do not have into account, in the desirable degree, the quality of services and social welfare.

JEL: C5, C51, H51, H52, I1, I2, O51, O52, O57

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1.- Introduction

Econometric models of consumer behaviour such as systems of demand analysed in Arranz(1996) and (2002), show that there are two special groups of expenditure, Education and Culture by one hand and Medical care by another one, where there are big differences in the answer to increases in family income, due to the substitution effects that public consumption expenditure induce on these two groups.

So we need to observe jointly the evolution of Private and Public Consumption, but the main problem for that is the scarcity of statistics for the latter of both groups. Really there are few statistics on Public Consumption and the discrepancies are very big even from the same institution, as we shall see on section 3.

In this paper we present some estimations of Private and Public Consumption based on a mix of OECD National Accounts Statistics and OECD Purchasing Power Parities and Real Expenditures, as both sources seems reliable but with different criteria for distinguishing between Private and Public Services and Goods.

In section 2 we present a view of the evolution of real Private Consumption Expenditure per capita on Medical Care, by one hand, and Education and Culture by another one, based on OECD National Accounts during the period 1970-94, and in section 3 we present an analysis of Private and Public Consumption Expenditure on both groups in the years 1990 and 1996, based on a comparison between different OECD sources.

In section 4 we present some econometric models, with a cross-section sample of OECD countries, which relate private expenditure on each of both groups with total private expenditure and with the level of public expenditure on the own group. One of the best formulations in both cases is the mix dynamic model, allowing for the influence of the lagged endogenous variable and the increases in the other explanatory variables. In section 5 we present the main conclusions.

Econometric models show that there is some degree of substitution between Public and Private Expenditure on both groups but this effect seems to be higher for Medical Care than for the group of Education and Culture. The trend to increase in this second group, independently of the increases in income, seems to be due to the Culture and Entertainment component of this group more than to the Educational demand.

2.-Private Consumption Expenditure on Medical Care, Education and Culture,1970-94.

Table 1 present the real values of Private Consumption Expenditure on Medical Care and Health, based on OECD National Accounts Statistics and Arranz(1997), while table 2 present the real values of Private Consumption Expenditure on Education and Culture, including also Recreational Services and Entertainment, and table 3 the total values of Private Consumption from the same sources.

Variables in these tables are expressed in per capita terms at 1990 prices and purchasing power parities, PPPs. The last column is the percentage of increase during the period 1970-94, and the figures for Germany correspond only to Western Germany.

The figures at National Accounts for Private Consumption seem generally more reliable than another statistical sources when there are contradictions between two or more sources, although some problems probably subsist even in high quality statistics, because sometimes it seems difficult to get information about direct public subsidies to families.

Those aids and subsidies for some specific expenditures, such as pharmaceuticals, books of fees for educational centres, are really public expenditures, because the source of financing, but sometimes appear as private ones because the way of buying. It should be desirable, for international comparisons, a higher degree of information on these subjects.

Table 1. Private Expenditure on Medical Care
(dollars by inhabitant at 1990 prices and PPPs)

Country	1970	1975	1980	1985	1990	1994	%Δ
Belgium	454	699	865	978	1119	1183	161
France	321	461	554	728	981	1114	247
Germany	173	200	247	291	333	376	117
Ireland	118	131	139	213	245	264	124
Italy	244	359	412	481	671	715	193
Netherlands	762	895	1013	1065	1179	1279	68
Spain	130	186	221	203	300	397	205
Denmark	127	133	149	158	190	200	57
Greece	151	168	174	182	185	222	47
UK	62	64	76	104	139	150	142
Japan	434	666	808	897	971	1089	151
Mexico	219	193	176	168	144	137	-37
USA	1270	1593	1882	2096	2392	2509	98

Table 2. Private Expenditure on Education and Culture
(dollars by inhabitant at 1990 prices and PPPs)

Country	1970.	1975	1980.	1985	1990	1994	%Δ
Belgium	286	354	463	521	667	730	155
France	334	441	547	600	784	792	137
Germany	563	712	813	833	1016	1050	87
Ireland	462	450	642	606	751	865	87
Italy	412	454	599	686	908	944	129
Netherlands	448	625	799	786	976	1022	128
Spain	295	386	387	391	504	525	78
Denmark	436	556	631	766	866	1015	133
Greece	151	174	225	274	309	336	123
UK	395	522	624	732	978	1055	167
Japan	448	520	655	825	1274	1401	213
Mexico	213	210	225	200	182	187	-12
USA	658	759	932	1142	1469	1657	152

In table 1 we can see that there are important differences among countries with similar levels of economic development, what very often is due to different levels of public expenditure. So the important difference between UK and Japan, for example does not mean

that British citizens have poor health services but only that Private Consumption in UK has a lower value because people receive a higher level of Public Expenditure on Health.

The highest position for Private Expenditure on Medical care in 1994 corresponds to the USA with 2509 dollars of 1990, followed by Netherlands, Belgium, France, and Japan, with more than 1000 dollars each of them.

The highest position for Private Expenditure on Education and Culture also corresponds to the USA, with 1657 dollars of 1990 by inhabitant in the year 1994, followed by Japan with 1401 and the following European countries with more than one thousand dollars: Germany, Netherlands, Denmark and UK.

Table 3. Total Private Consumption
(dollars by inhabitant at 1990 prices and PPPs)

Country	1970	1975	1980	1985	1990	1994	%Δ
Belgium	6077	7436	8633	8912	10129	10560	74
France	6164	7456	8520	9185	10411	10592	72
Germany	6011	6859	8085	8422	9785	9991	66
Ireland	4580	4811	5619	5575	6700	7289	59
Italy	5981	6652	7786	8423	10052	10266	72
Netherlands	6521	7379	8378	8326	9254	9823	51
Spain	4854	6066	6246	6359	7696	8009	65
Denmark	6864	7248	7576	8425	8484	9410	37
Greece	3329	4186	4708	5006	5444	5637	69
UK	5946	6570	7215	7998	9761	9903	67
Japan	5313	6554	7515	8379	10089	10735	102
Mexico	3001	3335	3803	3631	3676	3790	26
USA	9856	10811	11949	13277	14641	15100	53

Many countries have experienced percentage increases higher than 50% in real Private Consumption by head during the period 1970-95, such as Belgium with 74, France with 72, Germany with 66, Ireland with 59, Italy with 72, Netherlands with 51, Spain with 65, Greece with 69, United Kingdom with 67, Japan with 102 and the USA with 53.

The differences in total consumption and in the groups of tables 1 and 2, are due by one hand to the differences in the levels of development and, on another hand, to the differences in public policies of expenditure on public consumption. The level of development is more related with total individual consumption than only with private consumption, as it is shown in Guisan(2001).

In the case of Education the knowledge of the different systems of financing education in OECD countries has experienced an important improvement from 1990 thanks to the creation and work of the Education and Development Centre in that institution, and the interesting statistics and reports published by that centre. Besides that the National Accounts Statistics and the Purchasing Power Parities and Real Expenditure are another two important sources of data for comparing private and public evolution of Education and Culture.

In the case of Medical Care García-Cornejo(1999) presents a comparison of medical care systems and the recent evolution of those systems in several countries, which is interesting for the interpretation of the statistical data of expenditure on this group.

2.- Public and Private Expenditure on Medical Care, Education and Culture in 1990-96.

As we have mentioned previously, there are many difficulties for separating public and private expenditure because the many different ways that exist in different countries for subsidizing health and education financing, as it has been pointed out in several OECD studies. As provisional estimations of the public level of expenditure on Medical Care and Education and Culture in 1996 we present tables 4 and 5.

Table 4. Expenditure on Medical Care in 1996
(dollars by inhabitant at 1990 and 1996 prices and PPPs)

Country	At 1990 prices and PPPs			At 1996 prices and PPPs		
	Total	Private	Public	Total	Private	Public
1. Austria	1613	341	1271	1895	418	1477
2. Belgium	1738	371	1367	2043	467	1576
3. Finland	1313	270	1043	1543	346	1197
4. France	2276	376	1900	2674	434	2240
5. Germany	1895	378	1518	2227	474	1753
6. Ireland	1371	238	1133	1611	279	1332
7. Italy	1514	324	1190	1779	400	1379
8. Luxembourg[1]	1479	1450	29	1738	1734	34
9. Netherlands	1748	360	1388	2055	439	1616
10. Portugal	784	507	277	921	648	273
11. Spain	862	272	590	1013	327	686
12. Denmark	1321	231	1089	1552	288	1264
13. Greece	946	414	532	1112	564	548
14. Sweden	1251	178	1073	1470	219	1251
15. UK	1385	132	1252	1627	155	1472
16. Iceland	2734	242	2493	3213	323	2890
17. Norway	1425	257	1168	1674	314	1360
18. Switzerland[1]	1901	1825	77	2234	2144	90
19. Turkey[1]	152	106	46	179	125	54
20. Australia	1751	361	1391	2058	446	1612
21. New Zealand	1269	671	598	1491	819	672
22. Japan	3189	310	2878	3747	386	3361
23. Canada	2111	367	1744	2480	451	2029
24. USA	2896	2807	89	3402	3298	104

Notes. Own elaboration from OECD National Accounts, for Private Consumption, and from OECD Purchasing Power Parities and Real Expenditure, for Total Individual Consumption on Medical Care. [1]The figures for Luxembourg, Switzerland and Turkey do not follow the general procedure and are only based on the second source.

The order of the countries in these tables correspond to OECD Power Parities and Real Expenditure Statistics, and the values are given at 1996 prices, as they appear in the sources of data, and also at 1990 prices, which we elaborate from those sources for comparison purposes with other figures that are presented at 1990 prices and PPPs.

These figures were elaborated, based on OECD statistics: 1) We have taken Total Individual Consumption of each group from the OECD Purchasing Power Parities and Real Expenditure. 2) We have elaborated an estimation of real Private Consumption by inhabitant of each group on purchasing power parities from OECD National Accounts Statistics, and 3) We have estimated Public Consumption Expenditure on each group as the difference between both values.

In the cases of Luxembourg, Switzerland and Turkey the unavailability of table 11 in OECD National Accounts 1988-99 Vol.2, does not allow to follow that procedure and there we have taken as provisional estimation for Public Consumption Expenditure the value given at OECD PPPs and Real Expenditure, and as Private expenditure the difference between the total of each group and the public value.

Table 5. Expenditure on Education and Culture in 1996
(dollars by inhabitant at 1990 and 1996 prices and PPPs)

Country	At 1990 prices and PPPs			At 1996 prices and PPPs		
	Total	Private	Public	Total	Private	Public
1. Austria	2002	1205	797	2352	1473	879
2. Belgium	1993	782	1211	2342	983	1359
3. Finland	2075	904	1171	2438	1159	1279
4. France	1882	912	970	2211	1053	1158
5. Germany	1866	968	898	2193	1216	977
6. Ireland	1976	751	1225	2322	881	1441
7. Italy	1756	856	900	2063	1056	1007
8. Luxembourg	2345	1254	1081	2755	1473	1282
9. Netherlands	2149	997	1152	2525	1214	1311
10. Portugal	1802	532	1270	2117	679	1438
11. Spain	1077	844	233	1266	1016	250
12. Denmark	3198	1097	2101	3758	1367	2391
13. Greece	967	493	474	1136	672	464
14. Sweden	2018	843	1175	2371	1037	1334
15. UK	2117	1242	875	2487	1458	1029
16. Iceland	2592	1202	1390	3046	1604	1442
17. Norway	2273	1095	1178	2671	1336	1335
18. Switzerland	2006	1243	763	2357	1460	897
19. Turkey	393	117	276	462	137	325
20. Australia	2726	1327	1399	3204	1642	1562
21. New Zealand	1876	907	969	2204	1066	1138
22. Japan	2632	1292	1340	3093	1607	1486
23. Canada	2649	1150	1499	3113	1413	1700
24. USA	2939	1864	1075	3453	2190	1263

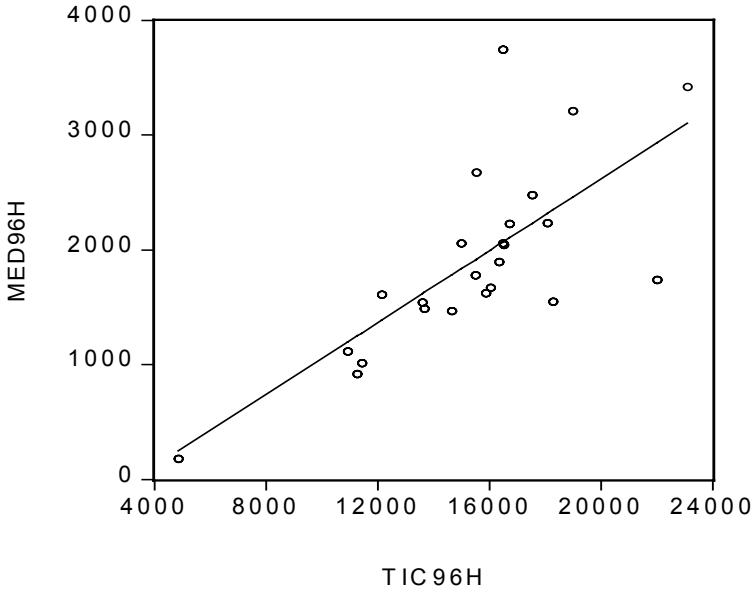
Notes. Own elaboration from OECD National Accounts, for Private Consumption, and from OECD Purchasing Power Parities and Real Expenditure, for Total Individual Consumption on Medical Care. [1]The figures for Luxembourg, Switzerland and Turkey do not follow the general procedure and are only based on the second source.

In the case of the USA we do not have taken the Total Individual Expenditure on Medical Care from the OECD PPPs and Real Expenditure Statistics. Instead of that we have taken from that source only an estimation of Public Expenditure, and it was the sum of this

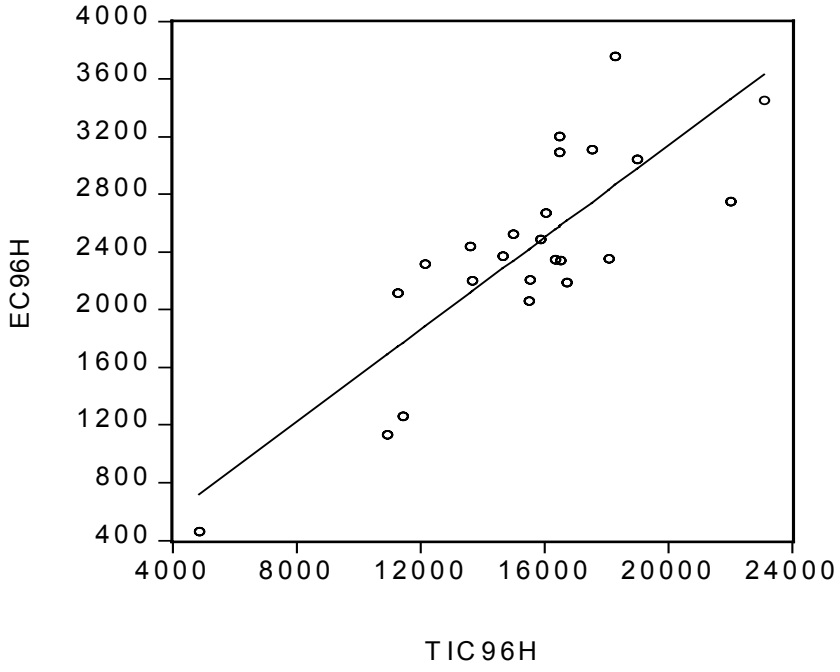
quantity with the data of Private Expenditure on Medical Care from National Accounts our estimation of Total Individual Consumption Expenditure. The result is slightly higher than the alternative source.

Graphs 1 and 2 show the high positive correlation of both groups of expenditure with Total Individual Consumption, while graphs 3 to 6 show the values of private and public expenditure.

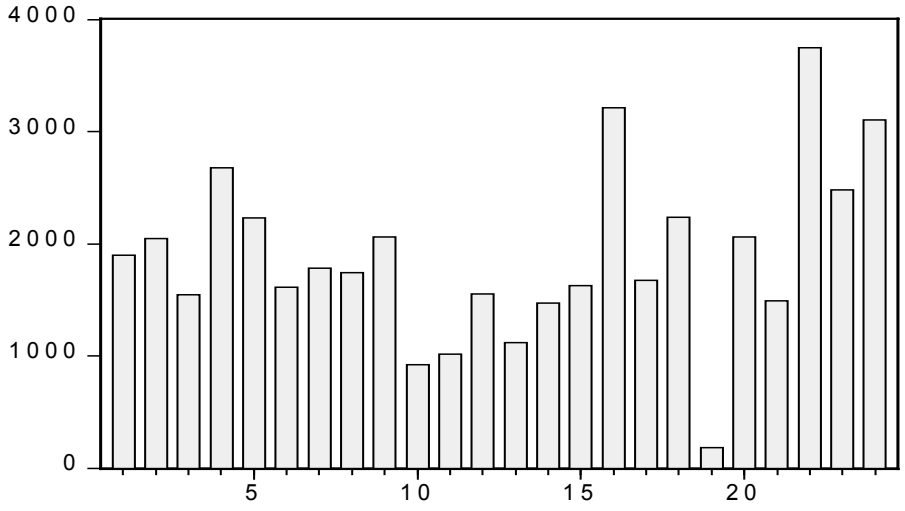
Graph 1. Expenditure on Medical Care and Total Individual Consumption in 1996
(dollars by inhabitant at 1996 prices and PPPs)



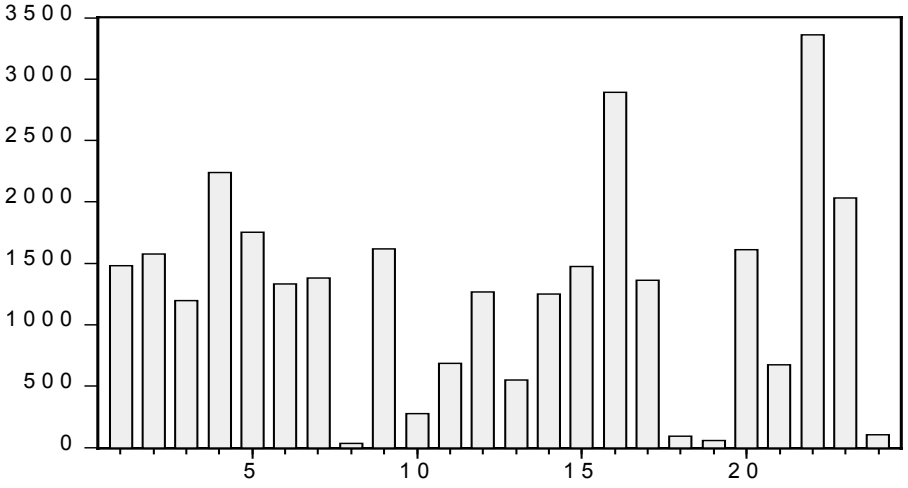
Graph 2. Expenditure on Education and Culture and Total Individual Consumption in 1996
(dollars by inhabitant at 1996 prices and PPPs)



Graph 3. Individual Consumption Expenditure on Medical Care in 1996
(dollars by inhabitant at 1996 prices and PPPs)



Graph 4. Public Consumption Expenditure on Medical Care in 1996
(dollars by inhabitant at 1996 prices and PPPs)

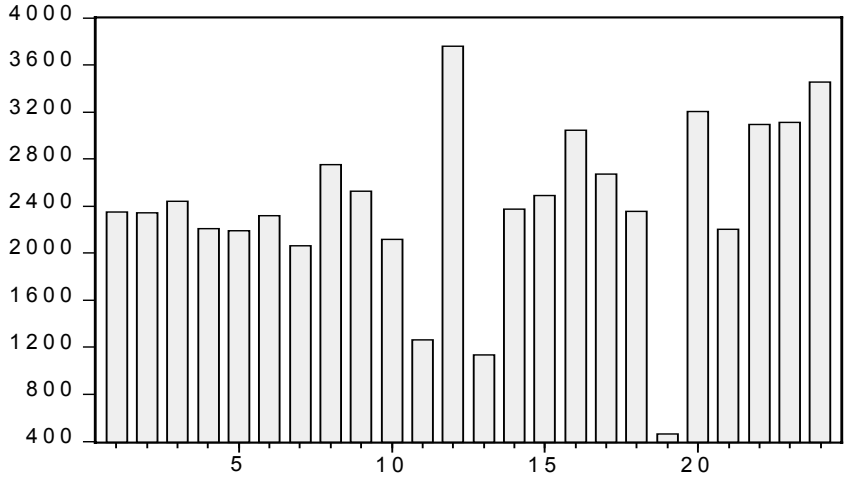


Regarding total consumption expenditure, both public and private, by inhabitant, we can see in graph 3 that the most outstanding countries are those with a value over 2500 dollars: France with 2674, Iceland with 3213, Japan with 3747 and the USA with 3402.

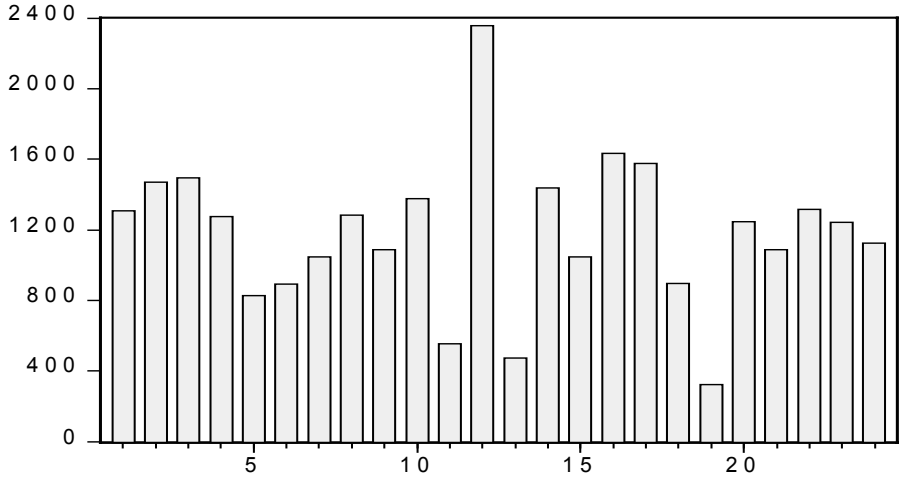
A middle level of expenditure by inhabitant on Medical Care correspond to countries with values between 1500 and 2500 dollars: Austria with 1895, Belgium with 2043, Finland with 1543, Germany with 2227, Ireland with 1611, Italy with 1779, Luxembourg with 1738, Netherlands with 2055, Denmark with 1552, Sweden with 1470, United Kingdom with 1627, Norway with 1674, Switzerland with 2234, Australia with 2058, New Zealand, with approximately 1500, and Canada with 2480.

The lowest levels correspond to countries below 1500 dollars by inhabitant on individual Medical Care: Portugal with 921, Spain with 1013, Greece with 112 and Turkey with 179.

Graph 5. Individual Consumption Expenditure on Education and Culture in 1996
(dollars by inhabitant at 1996 prices and PPPs)



Graph 6. Public Consumption Expenditure on Education and Culture in 1996
(dollars by inhabitant at 1996 prices and PPPs)



The most outstanding countries in the level of expenditure by inhabitant on Education and Culture, according to graph 5, are those with more than 2500 dollars: Luxembourg with 2755, Netherlands with 2525, Denmark with 3758, Iceland with 3046, Norway with 2671, Australia with 3204, Japan with 3093, Canada with 3113 and the USA with 3453.

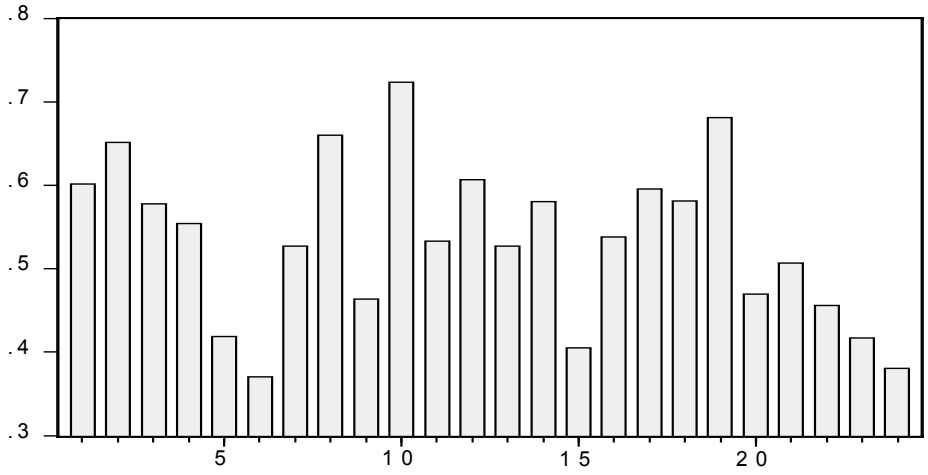
A middle level corresponds to countries with an individual expenditure by inhabitant on Education and Culture between 1500 and 2500 dollars: Austria with 2352, Belgium with 2342, Finland with 2438, France with 2211, Germany with 2193, Ireland with 2322, Italy with 2063, Portugal with 2117, Sweden with 2371, UK with 2487, Switzerland with 2357, and New Zealand with 2204.

The lowest levels of individual expenditure on Education and Culture, below 1500 dollars by inhabitant correspond to: Spain with 1266, Greece with 1136 and Turkey with 462.

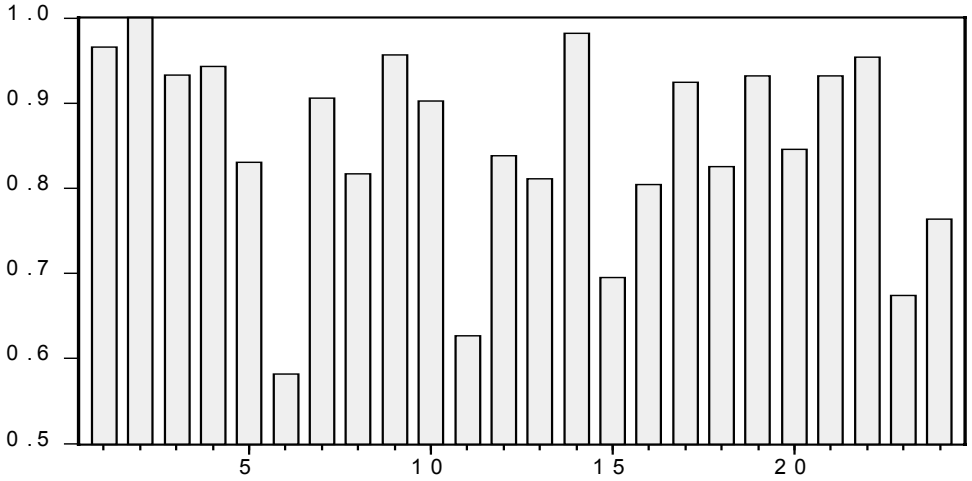
Graph 7, present the share of Public on Individual Expenditure on Education and Culture, and graph 8 the share of Public on Individual Expenditure on Education only, without Culture.

These figures could underestimate some types of public expenditure, as it happens for examples in the case of books, where the majority of countries present in this statistical source a zero value for public expenditure on this item, when it is clear that in real life there are several countries with important subsidies to the purchasing of school and university books.

Graph 7. Ratio of Public/Individual Consumption of Education and Culture



Graph 8. Ratio of Public/Individual Consumption of Education



In graph 7 we can see that the percentage of public expenditure on individual consumption of education and culture usually varies between 40% and 60%, while in graph 8 we can see that the case of only Education the percentage is higher, usually between 60% and 100%.

The percentages of Ireland and Spain in graph 8 could be underestimated if the statistics do not include all the public subsidies to private education. The differences between

Ireland and Spain should be more favourable to Ireland if we would include also public financing of the expenditure on books by inhabitant, which is much higher in the case of Ireland.

The higher effort of Irish Government to financing public and private education, in comparison with countries, like Spain, with similar levels of Gross Domestic Product by inhabitant during the period 1960-85, has been a very positive factor for the improvement in the level of economic development of this country, as it is shown in Guisan, Neira and Aguayo(2000) and Neira and Iglesias(2001), among others.

The group of Expenditure on Education and Culture includes many different goods and services related with entertainment, culture and education. Given the high importance that education have in socio-economic development, we think that it seems convenient to have separated series for this subject.

As there have been important advances in the level of knowledge that exist about Education indicators, thanks to the work and publications of Education at a Glance, and another statistics, by OECD, it could be interesting to include at National Accounts Statistics a synthesis of main indicators of Consumption Private and Public Expenditure on Education, including books, computers and living expenses of students.

4.- Econometric Models

The well known articles by Newhouse(1977) and (1992) have been very influential for the estimation of a Health Expenditure function, and the most common regressions for that purpose include income per head, the ageing of population and the share of public expenditure on Gdp, as explanatory variables.

Hitiris(1999) present an estimation with a panel of observations of 7 OECD countries during the period 1960-90, with the purpose of analysing the factors that explain the fast rising of Health Expenditure on many countries, with a preoccupation about the cost containment. However we think that the increase in the share of Medical Care on total individual Consumption is not a wrong feature of some countries but a natural and reasonable demand of societies.

In fact people generally make a positive assessment of policies focused on the improvement of Medical Care, and they are right, as socio-economic welfare depends very much on the good level of this important services and goods.

Some countries with good levels of Medical Care Expenditure, and with population highly satisfied with the level reached, like France and Japan, have experienced critical reviews of the system by authors who consider the convenience of a cost reduction, but the measures to reduce public expenditure usually lead to an increase on private consumption, as people insist on their demand if they can afford for that. This reaction of population is reasonable and government economists should understand that the trend to increase this type of expenditure is positive for the people, and even for the economic growth, when the country has the means for that.

On the other hand Giannoni and Hitiris(1999) show that in the case of Italy the central government policies for containment of the growth of health care expenditure in

combination with the decentralization in the administration and provision of health care have resulted in interregional inequality, aggravating the existing regional disparities. They estimate Health Care Expenditure functions at regional level, including the following explanatory variables: Gdp by inhabitant, Ageing, Number of Beds by Hospital, and the Number of Hospital Staff and some dummies. The first, second and fourth variables appear with a coefficient positive and significant while the third variable appears with a coefficient negative that they interpret as an slight reduction due to the effect of scale economies.

We think that there are many problems of inefficiency in some countries related with the quality of services, more due to the lack of enough medical and non medical personnel than to and excessive expenditure on that services. So we consider that Health Economics is not a matter of reduction and containment on Medical Care and so economists should not be excessively focused on making suggestions for the reduction of this expenditure, but they should be more interested in making suggestions for increasing the level of welfare of both patients and personnel, making all the Health system to evolve gradually to higher levels of quality and satisfaction for all the parts.

Here we present some econometric models for Private Consumption Expenditure on the groups of Medical Care and Education and Culture, with a sample of 24 OECD countries in 1996, having into account the level of family income, by means of the variable of total Consumption Expenditure, and the substitution relation of public expenditure on private one.

Another variables like ageing and relative prices of goods and services, could also have a role in explaining the differences among countries, but we deem that the two explanatory variables that we include, together with the lagged value of the explained variable, are the most important for the purpose of explaining the main differences among countries, and in this paper we do not include ageing as explanatory variable.

We use the following symbols and meanings for the variables in the models:

Dx = X96-X90. Difference, at 1990 prices and PPPs of real value of X, in 1990-96

EDUC = Education and Culture

F = Family Expenditure = Private Expenditure

G = Government Expenditure = Public Expenditure

I = Individual = Private + Public = F + G

MED = Medical Care

TCF = Total Private Consumption Expenditure

TIC = Total Individual Consumption = Private + Public Expenditure on all groups

Dummies=Di, for i=1, 2,…,24, country dummies.

The current sample correspond to the year 1996 and the lagged values to 1990. All the variables are expressed in dollars by inhabitant, indicated by H at the end of each variable

name in PPPs. In the case of the sample of 24 OECD countries for Total Expenditure figures are expressed at current prices and PPPs, while in the case of the sample of 12 OECD countries for Private Expenditure figures are expressed at 1990 prices and PPPs.

We present two groups of models: 1) Econometric Models of Individual Expenditure, with data for 24 countries in 1996 with data in dollars at current PPPs for years 1990 and 1996. 2) Econometric Models of Private Expenditure, with data for 12 OECD countries, with all data in dollars at 1990 prices and PPPs.

Econometric Models of Total Expenditure on Health, Education and Culture

Equations 1 to 3, show the results for Medical Care, with data from OECD Purchasing Power Parities and Real Expenditure, which present the problem of a high degree of underestimation of Private Consumption on Health in Germany and another countries. The explanatory variables are the lagged value of dependent variable, the increase in Total Individual Consumption by inhabitant and the increase in Government Expenditure on Medical care during the period 1990-96.

Equation 1. Mixed Dynamic Model for Medical Care
Dependent Variable: MEDI96H
Method: Least Squares
Sample: 1 24
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTICH	0.096621	0.029970	3.223916	0.0045
DMEDGH	0.636565	0.142387	4.470654	0.0003
MEDI90H	1.074294	0.073995	14.51853	0.0000
D17	-748.1567	258.5601	-2.893551	0.0093
D22	1474.211	256.2432	5.753170	0.0000

R-squared	0.917117	Mean dependent var	1893.208
Adjusted R-squared	0.899668	S.D. dependent var	779.5996
S.E. of regression	246.9393	Akaike info criterion	14.03921
Sum squared resid	1158602.	Schwarz criterion	14.28464
Log likelihood	-163.4706	Durbin-Watson stat	1.744686

Equation 2. First Differences Model for Medical Care
Dependent Variable: DMED6
Method: Least Squares
Sample: 1 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTIC6	0.122524	0.015257	8.030816	0.0000
DMEDG6	0.597103	0.136883	4.362129	0.0003
D17	-752.4728	258.5768	-2.910055	0.0087
D22	1488.576	255.8954	5.817125	0.0000

R-squared	0.810083	Mean dependent var	533.2083
Adjusted R-squared	0.781596	S.D. dependent var	528.5032
S.E. of regression	246.9894	Akaike info criterion	14.00758
Sum squared resid	1220076.	Schwarz criterion	14.20392
Log likelihood	-164.0910	Durbin-Watson stat	1.752759

Equation 3. Mixed Dynamic Model for Medical Care, with White heteroskedasticity

Dependent Variable: MEDI96H
Method: Least Squares
Sample: 1 24
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTIC	0.096621	0.033544	2.880475	0.0096
DMEDG	0.636565	0.113025	5.632090	0.0000
MEDI90H	1.074294	0.059348	18.10155	0.0000
D17	-748.1567	88.21423	-8.481134	0.0000
D22	1474.211	90.84579	16.22762	0.0000

R-squared	0.917117	Mean dependent var	1893.208
Adjusted R-squared	0.899668	S.D. dependent var	779.5996
S.E. of regression	246.9393	Akaike info criterion	14.03921
Sum squared resid	1158602.	Schwarz criterion	14.28464
Log likelihood	-163.4706	Durbin-Watson stat	1.744686

A coefficient lower than unity, near 0.60, in equations 1 and 3 for the variable DMEDG indicate that an increase on government expenditure on medical care implies a reduction of private expenditure on this group of expenditure, showing the existence of some substitution effects. Norway and Japan show special circumstances according to the corresponding coefficients of dummies. In the case of dummies this effect could be to problems with the provisional data, as we have mentioned before. In the case of Japan it seems that

Equations 4 and 6 present some models for total individual expenditure con education and culture by inhabitant in 1996, as a function of its lagged value in 1990, and the increases in Total Individual Consumption and in Government expenditure on this group of education and culture during the period 1990-96.

Equation 4. Mixed Dynamic Model for Education and Culture, without dummies

Dependent Variable: EDUCT96H
Method: Least Squares
Sample: 1 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTIC	0.130888	0.024193	5.410092	0.0000
DEDUCG	0.787120	0.180622	4.357839	0.0003
GECT90H	0.971068	0.044405	21.86855	0.0000

R-squared	0.947015	Mean dependent var	2414.125
Adjusted R-squared	0.941969	S.D. dependent var	727.9877
S.E. of regression	175.3702	Akaike info criterion	13.28814
Sum squared resid	645848.5	Schwarz criterion	13.43540
Log likelihood	-156.4577	Durbin-Watson stat	1.753850

Equation 5. Mixed Dynamic Model for Education and Culture, with dummies
Dependent Variable: EDUCT96H
Method: Least Squares
Sample(adjusted): 1 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTIC6	0.152967	0.013196	11.59168	0.0000
DEDUCG6	1.002095	0.102114	9.813475	0.0000
EDUCT90H	0.901732	0.022934	39.31877	0.0000
R-squared	0.993324	Mean dependent var		2414.125
Adjusted R-squared	0.988189	S.D. dependent var		727.9877
S.E. of regression	79.11664	Akaike info criterion		11.88329
Sum squared resid	81372.76	Schwarz criterion		12.42323
Log likelihood	-131.5994	Durbin-Watson stat		1.587243

Equation 6. Mixed Dynamic Model for Education and Culture,
with dummies and White heteroskedasticity
Dependent Variable: EDUCT96H
Method: Least Squares
Sample(adjusted): 1 24
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTIC6	0.152967	0.009325	16.40329	0.0000
DEDUCG6	1.002095	0.068466	14.63636	0.0000
EDUCT90H	0.901732	0.011976	75.29424	0.0000
R-squared	0.993324	Mean dependent var		2414.125
Adjusted R-squared	0.988189	S.D. dependent var		727.9877
S.E. of regression	79.11664	Akaike info criterion		11.88329
Sum squared resid	81372.76	Schwarz criterion		12.42323
Log likelihood	-131.5994	Durbin-Watson stat		1.587243

Dummies coefficients of Model 5

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D16	-328.8275	86.53698	-3.799850	0.0022
D17	-327.3730	85.17273	-3.843636	0.0020
D18	385.7823	90.38391	4.268263	0.0009
D20	347.7589	83.11968	4.183834	0.0011
D12	-183.9750	94.18589	-1.953318	0.0726
D13	-262.9645	89.24313	-2.946608	0.0113
D22	209.6297	84.19737	2.489741	0.0271
D23	223.1637	85.19080	2.619575	0.0212

Dummies coefficients of Model 6

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D16	-328.8275	42.13811	-7.803567	0.0000
D17	-327.3730	37.17661	-8.805886	0.0000
D18	385.7823	40.69235	9.480462	0.0000
D20	347.7589	32.99357	10.54020	0.0000
D12	-183.9750	39.98793	-4.600762	0.0005
D13	-262.9645	35.56336	-7.394254	0.0000
D22	209.6297	31.04228	6.753037	0.0000
D23	223.1637	26.22728	8.508839	0.0000

Private Consumption Expenditure on Health, Education and Culture

For a more clear conclusion on substitution effects we estimate same equations for Private Consumption Expenditure on both groups, in order to test if there is a significant reduction on private consumption expenditure when there is an increase on public one. We test that hypothesis in both groups: Medical Care, and Education and Culture.

We can also test if that coefficient is equal or different than unity, in order to see the degree of substitution. If there is a total substitution that coefficient should be equal to unity and lesser than one in another case.

These estimations where performed with data of only 11 OECD countries as we have estimated series for all the data only for this group of countries. Countries included in the sample are those of tables 1 and 2.

Equations 7 for Medical Care, and equation 8 for Education and Culture present the results of those estimations. The estimations correspond to the option with White heteroskedasticity standard errors, which account for the problem of heteroskedasticity that could arise from the heterogeneity of countries, but the results should be quite similar in this case without this correction.

Equation 7. Model for Private Consumption on Medical Care
Dependent Variable: MEDF96H
Method: Least Squares
Included observations: 12
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DCTFH	0.246328	0.060562	4.067404	0.0028
DMEDGH	-0.427403	0.133182	-3.209159	0.0107
MEDF90H	0.940876	0.134424	6.999323	0.0001
R-squared	0.923590	Mean dependent var		517.8958
Adjusted R-squared	0.906609	S.D. dependent var		725.2573
S.E. of regression	221.6376	Akaike info criterion		13.85228
Sum squared resid	442109.2	Schwarz criterion		13.97351
Log likelihood	-80.11370	Durbin-Watson stat		1.222677

Equation 8. Private Consumption on Education and Culture
Dependent Variable: EDUCF96H
Method: Least Squares
Included observations: 12
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DCTFH	0.095301	0.023829	3.999333	0.0031
DEDUCGH	-0.303838	0.066199	-4.589798	0.0013
EDUCF90H	1.100433	0.039920	27.56588	0.0000
R-squared	0.920953	Mean dependent var		1008.262
Adjusted R-squared	0.903387	S.D. dependent var		346.3046
S.E. of regression	107.6407	Akaike info criterion		12.40779
Sum squared resid	104278.6	Schwarz criterion		12.52902
Log likelihood	-71.44675	Durbin-Watson stat		1.647465

These results confirm the existence of substitution effect between public and private expenditure in both groups of consumption expenditure, with a estimated coefficient slightly higher in absolute value in the case of Medical Care. The hypothesis of total substitution is rejected in both groups, as the coefficient of the increase in government expenditure is significantly different of unity in both cases.

We hope to follow this research with data from more countries in order to corroborate this results. We will try to separate Education Expenditures from Culture, but it is not as easy to perform as some important expenditures very much related with education as the expenditure on educational books is usually mixed with recreational expenditures in the statistics.

5.- Conclusions

Some of the main conclusions of this study, regarding private and public consumption expenditure on Medical Care, Education and Culture are the following:

1) The expenditure groups of Medical Care and Education and Culture are important and show an increasing share in total individual consumption, with economic development, as the demand for these goods and services usually contributes to a higher quality of life and welfare.

2) The percentages of real increase of private expenditure on Medical Care by head usually has been higher than 100% during the period 1970-94, and the same has happened with the increase of private expenditure on Education and Culture by head in OECD countries, although the real increase in total private consumption during that period has been general lower of 75%.

3) There are contradictions among different statistical sources of data. The estimations of private consumption from National Accounts Statistics seem more reliable than those from another sources that present an underestimation of public expenditure and an overestimation of private ones. This problem is due to the difficulties that in some public systems exist for distinguishing both types of financing. We have tried to avoid this problem by means of the estimation of Public expenditure as the difference between individual consumption and private consumption, taking the value of private consumption from National Accounts Statistics.

4) According to the selected statistics the highest levels of total expenditure by inhabitant on Medical Care, among 24 OECD countries in 1996, correspond to Japan with 3747 dollars, followed by the USA with 3402 dollars, Iceland with 3213, France with 2674, and Canada with 2480.

5) There are important differences between private and public distribution of Medical Care expenditure with countries like the USA where about 97% is private and other cases like Japan, France, and the majority of these 24 countries, where more than 80% is public.

6) The highest levels of total expenditure by inhabitant on Education and Culture, among 24 OECD countries in 1996, correspond to Denmark with 3758, followed

by the USA with 3453, Australia with 3204, Canada with 3113, and Japan with 3093.

7) It is very remarkable the case of Ireland, country that thanks to their effort made to increase the educative level of population, has reached much higher levels of development than Spain and another similar countries that have devoted less financing to this important expenditure.

8) The econometric models show that there is a positive and significant impact of the increase in total consumption by inhabitant on both groups of Medical Care and Education and Culture.

9) The econometric models also show that there is a substitution effect of public expenditure on private one, in both cases, being this effect more remarkable in the case of Medical Care.

10) The coefficients of the effect of public expenditure on private one, in both cases, are significantly lower than unity, with an estimated value of –0.43 in the case of Medical Care and –0.30 in the case of Education and Culture.

As a final and more general comment we would like to show our disagreement with the frequent attempts to lower the values of expenditure on Medical Care and Education, in some industrialized countries, and we show our clear support to the improvement of both social services as they are very important for well-being and they have an important positive effect no only on economic development but also in the quality of life.

On the other hand we think that it would be very important to improve the aid of European Union to increase the low level of expenditure on education of Turkey and another countries which are going to join a common economic space with EU and another Mediterranean countries.

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